

SMORODA, I.M.

Experience with moving the housing of a coke battery along the coal  
tower. Stroi.prom. 34 no.5:48-49 My '56. (MLRA 9:8)  
(Coke ovens)

AUTHOR: Smoreda, I.M., (Koksokhimmontazh). 68-8-10/23

TITLE: On Changes in the Design of Main Waste Gas Flues for Coke Ovens  
(Ob izmenenii konstruktsii borovov koksovykh pechey).

PERIODICAL: Koks i Khimiya, 1957, No.8, pp. 28-29 (USSR)

ABSTRACT: The paper contains some remarks on the paper of the same title by Ya.M. Eydel'shtein, published in "Koks i Khimiya", 1956, Nr.8. The author disagrees with the proposed method of redesigning coke oven main waste gas flues, namely one flue for one-half of the ovens and 2 mains for the other half near to the stack. Instead, a uniform increase in the width of the flue is proposed. There is one figure and one Slavic reference.

ASSOCIATION: Koksokhimmontazh.

AVAILABLE: Library of Congress

Card 1/1

SMORODA, I.M., inzh.

Mechanized storage of mortars. Mont.i spets.rab.v stroi. 22 no.6:  
21-22 Je '60. (MIRA 13:7)

... Trest Koksokhimteplomontazh.  
(Mortar--Storage)

SMORODA, I.M., inzh.

Suspended crane-girders for conveying refractory materials in constructing  
batteries of coke ovens. Mont. i spets.rab.v stroi. 22 no.11:18-19 N'60.  
(MIRA 13:10)

1. Trest Koksokhimateplomontash.

(Cranes, derricks, etc.) (Coke industry--Equipment and supplies)

SHIMODA, I.M.

New organization of coke-oven construction work. Koks i khim. no.2:  
50-53 '61. (MIRA 14:2)

1. Koksokhinteplemontazh.  
(Coke ovens)

TARNOMSKIIY, A.G., inzh.; SHKLOVSKIY, Ye.I., inzh.; IYULIN, S.D.,  
inzh.; GURVICH, E.I., inzh.; RABINOVICH, S.Yu., inzh.;  
BRYAPACHENKO, B.G., inzh.; SMORCDA, I.M., inzh.

Investigation of deformations in the jacket of blast furnaces  
during their erection by protrusion. Prom. stroi. 42 no. 6:  
9-12 '65. (MIRA 18112)

TROITSKIY, V.N.; NAKHAYEV, N.Ye.; SMORODIN, A.I.; BEREMBLYUM, G.B.

Causes for the breakdown of air preheaters. Metallurg 8 no.8:  
11-12 Ag '63. (MIRA 1c:10)

1. Novolipetskiy metallurgicheskiy zavod.

SMORODIN, A.I. Leningrad

Use of the asymptotic method for the analysis of waves emanating  
from a source in nonsteady motion. Prikl. mat. i mekh. 29 no.2:  
62-69 Jan-F '65. (MIRA 13:4)



SMORODIN, F.

Production of high-quality melted butter (butter oil).  
F. Smorodin (Milk Combining, Kiev). *Molochovaya Prom.*  
15, No. 6, 35 (1954).—A high-quality butter oil was produced  
by melting 2.5 kg. chunks of butter in 1000 l. of water at  
55-60°, heating the oil to 90°, skimming the foam on  
the surface, lowering the oil temp. to 50°, and subse-  
quently reheating to 75-80°. The clear oil is put in barrels  
at 65° and stored at 10-13°. Vladimir N. Krukovsky

SMORODIN, F.S.

How we service the equipment of electric centralization. Avtom.  
telen.i sviaz' 3 no.1:27-29 Ja '59. (MIRA 12:1)

1. Starshiy elektromekhanik elektricheskoy tsentralizatsii  
stantsii Krasnyy Liman Donetskoy dorogi.  
(Railroads--Electric equipment)

SMORODIN, G.S.

29138 Vglublenie pakhotnogo sloya na chernozemakh i serykh lesnykh pochvakh Bashkirii. Trudy Bashkie. Nauch-issled. Polevod Stantsii, T. III, 1948  
(Kolon-Titul: 1947,) S. 196-208-Bibliogr: 5 Nazv.

SO: Letopisi Zhurnal'nykh Statey, Vol. 39, Moskov, 1949

SMORODIN, G.S.

29121

Agrotyekhnichyeskaya otsyenka traktornykh plugov. Trudy Bashkir. nauch.-  
isslyed. polyevod. stansii, t. III, 1948 (kolcn-titul: 1947), s. 454-75. --  
Bibliogr: 16 nazv

SO: LETOPIS' NO. 34

4404-0114, 5.12  
CHERODIN, G.S.

Tillage of leached Chernozem soils in the Bashkir piedmont area.  
Zemledelia 5 1953-1957. (ALBA 1957)

1. Bashkirskiy nauchnoissledovatel'skiy institut.  
(Bashkiria--Tillage)



SMORODIN, Georgiy Stepanovich, for Doctor of Agricultural Sciences on  
the basis of dissertation defended 16 Mar 59 in Council of ~~the~~ Moscow  
Order of Lenin Agricultural Academy im. Timiryazev, entitled: "Agro-  
physical Properties of the <sup>Leached Chernozems</sup> ~~De-Alkalized Black Earths~~ of the Southern  
<sup>Ural Foothills</sup> (Bashkir) ~~Promontories of the Ural~~ and ~~the~~ Peculiarities of their  
Cultivation." (BZhVISO USSR, 2-61, 25)

SMORODIN, I.; NOVICHENKO, I.

How to train in methods of extinguishing incendiary materials.  
Voen. znan. 34 no.8:20-21 Ag '58. (MIRA 11:12)  
(Fire extinction)



SMORODIN, I., kand. sel'skokhoz. nauk; BOBLYARSKIY, D.

Wide row single-seed planting of corn. Zemledelis 27 no. 5:43-45  
My '65. (MIRA 1966)

1. Donskoy nauchno-issledovatel'skiy institut sel'skogo khozyaystva.

SMORODIN, I.I., kand.sel'skokhozyaystvennykh nauk

For high corn yields in the Don Valley. Zemledelie 23  
no.4:25-32 Ap '61. (MIRA 14:3)

1. Donskoy nauchno-issledovatel'skiy institut sel'skogo  
khozyaystva. (Don Valley—~~Corn~~(Maize))

BABKIN, I.A.; VELYUGO, V.M.; DIVAKOV, P.D.; ZAPOL'SKIY, G.N.; KIPRIYAN, K.M.; KISELEV, M.G.; KORABLEV, M.D.; SILKOV, G.A.; SMORODIN, I.Ya.; KANEVSKAYA, M.D., red.; GERASIMOVA, V.N., tekhn.red.

[Manual for training and testing for a first-class rating in the organization "Ready for Antiaircraft Defense."] Uchebno-metodicheskoe posobie po provedeniiu trenirovok i priemu norm "Gotov k PVO" 1-i stupeni. Moskva, Izd-vo DOSAAF, 1959. 110 p. (MIRA 12:5)

1. Vsesoyuznoye dobrovol'noye obshchestvo sodeystviya armii, aviatsii i flotu.

(Civil defense)

BELOUSOV, M.S., kand. ekon. nauk, dots.; VORONIN, M.G., kand. ekon. nauk; DUNDUKOV, G.S., kand. ekon. nauk, dots.; KAMYSHANOV, F.I., kand. ekon. nauk; KOLESOV, V.S.; KUPRIYENKO, A.N., kand. ekon. nauk; PEN'KOV, Ye.G., kand. ekon. nauk, dots.; SOLONEVICH, F.F. Prinimal uchastiye SMORODIN, M.B.; MUKHIN, N.A., retsenzent; FEDOTOV, G.N., retsenzent; STARCHAKOVA, I.I., red.; KIRAKOZOVA, N.Sh., red.; MEDRISH, D.M., tekhn. red.

[Accounting in commerce] Bukhgalterskii uchet v trgovle.  
[By] E.S. Belousov i dr. Moskva, Gostorgizdat, 1963. 528 p.  
(MIRA 17:1)

1. Prepodavateli kafedry bukhgalterskogo ucheta Moskovskogo instituta narodnogo khozyaystva im. G.V. Plekhanova (for Belousov, Voronin, Dundukov, Kamyshanov, Kolesov, Kupriyenko, Pen'kov, Solonevich). 2. Glavnyy bukhgalter Soyuza potrebitel'skikh obshchestv RSFSR (for Fedotov).

SHCHERBA, Y.I.

SHCHERBA, Y.I.: "The significance and methods of using artistic verbal style in teaching". Moscow, 1955. Academy of Pedagogical Science RSFSR. Inst of the Theory and History of Pedagogy. (Dissertations for the Degree of Candidate of Pedagogical Sciences).

6: Knizhnyaya laboriya No 45, 5 November 1955. Moscow.

SMORODIN, N.F.

Latent period of the change in the transmembrane potential of  
the motoneurons under some interoceptive influences. Vest.  
LQU 20 no.15:114-119 '65. (MIRA 18:9)

SMORODIN, N.F.

Change in the membrane potential of motoneurons following some  
interceptive effects. Dokl. AN SSSR 165 no.3:721-724 N '65.  
(MIRA 18:11)

1. Nauchno-issledovatel'skiy fiziologicheskii institut im. A.A.  
Ukhtomskogo Leningradskogo gosudarstvennogo universiteta im.  
A.A. Zhdanova. Submitted February 13, 1965.

CHRONICLE N.G.

Overfulfillment of the assignment. 1971. 1. part. 2. 1971. 41  
(M. 17.9)

1. Direktor shpaleuropticheskogo zavoda,stantsiya kalikino,  
Gor'kovskoy oblasti.



JMORODIN, S. S.

"Appraisal of the Comparative Performance of the Soviet RF-17 and PB-15 Rock Drills",  
Gornyy Zhurnal, No. 12, 1949.

Translation W-12195, 27 Jul 1950

124-58-9-9745

Translation from: Referativnyy zhurnal, Mekhanika, 1958, Nr 9, p 38 (USSR)

AUTHOR: Smorodin, S. S.

TITLE: Calculation and Design of a High-pressure Centrifugal Ventilation Blower of the Type Originated by Academician A. P. German (Raschet i konstruirovaniye vysokonapornogo tsentrobezhnogo ventilyatora sistemy akad. A. P. Germana)

PERIODICAL: V sb.: Shakhtn. ventilyatory i ventilyatorm. ustanovki. Moscow, Ugletekhizdat, 1957, pp 66-76

ABSTRACT: Presentation of reasonings relative to the possibility of realizing a high-pressure ventilation blower capable of creating a static pressure in excess of  $500 \text{ kg/m}^2$  with peripheral velocities not in excess of 60 m/sec. Among the various possible schemes, an examination is made of the arrangement, proposed by academician A. P. German, of a centrifugal blower having a rotor consisting of two composite runner crowns, each of which revolves with a peripheral velocity of up to 60 m/sec. A guide-vane stator arrangement is provided between the two runner crowns of the rotor. Estimates of the anticipated characteristics of such a blower are made.

Card 1/1

1 Blowers--Design 2. Blowers--Mathematical analysis. A.S.Ginevskiy

SMORODIN, S.S.

Investigating the characteristics of compressed-air driven tools.  
Zap. Len. gor. inst. 34 no.1:119-132 '57. (MLRA 10:9)  
(Coal mining machinery--Pneumatic driving)

Doc 11, 11, 11, 11, 11, 11 -- (11) "Investigation of the Work  
of the College of Installations During Difficult Working," Leningrad  
1951, 11, 11 (Leningrad Mining Institute in G. V. Plesmanov)  
(11, 11-11, 11)

SMORODIN, S.S., kand.tekhn.nauk

Results of turbocompressor testing in Noril'sk mines. Izv.  
vys.ucheb.zav.; gor.zhur. no.2:125-129 '59.  
(MIRA 13:4)

1. Leningradskiy ordena Lenina i ordena Trudovogo Krasnogo  
Znameni gornyy institut imeni G.V.Plekhanova. Rekomendovana  
kafedroy gornoy mekhaniki.  
(Noril'sk--Mining engineering)  
(Turbomachinery--Testing)

SMORODIN, S.S.; TARAKANOV, S.N.; CHASNIKOV, O.N.

"Mining machinery" by N.V.Tikhonov. Reviewed by S.S.Smorodin,  
S.N.Tarakanov, O.N.Chashnikov. Razved. i okh. nedr 27 no.3:55-56  
Mr '61. (MIRA 14:5)

1. Leningradskiy gornyy institut.  
(Mining machinery) (Tikhonov, N.V.)

SMORODIN, S.S.

Hydraulic calculation of mine piping. Zap. LGI 47 no.1:3-11  
'62. (MIRA 16:5)  
(Pipe) (Mining engineering--Equipment and supplies)

SMORODIN, Sergey Semenovich; TSETNARSKIY, I.A., otv. red.; D'YAKOVA,  
G.B., red.izd-va; LOMILINA, L.N., tekhn. red.; MAKSIMOVA,  
V.V., tekhn. red.

[Mine air-duct networks] Rudnichnye vozdukhoprovodnye seti.  
Moskva, Gosgortekhnizdat, 1963. 156 p. (MIRA 16:8)  
(Mine ventilation)



STEFODIN, V.

Dairying - A vacuum and supplies

Aluminum molds for cheese. Mol. prom. 13, No. 9, 1952.

9. Monthly List of Russian Accessions, Library of Congress, December 1952, UNCL.

SMORODIN, V.A.

Application of microcinematography in mineralogical research.  
Min.sbor. no.5:291-296 '51. (MLRA 9:12)

1. Gosuniversitet imeni T.G.Shevchenko, Kiyev.  
(Photomicrography) (Mineralogy)

SMORODIN, Viktor Alekseyevich; ZHERDETSKAYA, N.N., redaktor; MALEK, Z.N.,  
tekhnicheskiy redaktor

[Nature photography] Fotografirovanie prirody. Moskva, Gos.izd-vo  
"Iskusstvo," 1957. 119 p. (MLRA 10:8)  
(Nature photography)

SMORODIN, V.A.

"Introduction to scientific cinematography" [in German]. Zhur.  
nauch. i prikl. fot. i kin. 2 no.1:79-80 Ja-F '57. (MIRA 10:3)  
(Cinematography)

AUTHOR: Smorodin, V.A. 3-2-32/32

TITLE: Pamphlet on the Use of Motion Pictures in Schools of Higher Education  
(Broshyura o primenenii kino v vysshey shkole)

PERIODICAL: Vestnik vysshey shkoly, Feb 1957, # 2, p 94-96 (USSR)

ABSTRACT: The article is a review of a booklet written by S.I. Arkhangel'-skiy and B.V. Kubeyev entitled "Uchebnaya i nauchnaya kinematografiya v vysshey shkole" (Instructing and Scientific Cinematography in a Higher School) and deals with the principle questions of using motion pictures as a means of education in higher educational institutions.

ASSOCIATION: Kiev State University imeni T.G. Shevchenko (Kiyevskiy gosudarstvennyy universitet imeni T.G. Shevchenko)

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SMORODIN, V.A.

The Kiev-16-G-2 motion-picture camera. Zhur. nauch. i prikl. fot.  
i kin. 2 no.3:225-228 My-Je '57. (MIRA 10:6)  
(Motion-picture cameras)

AUTHORS: Kakhitany, A.A.; Smorodin, V.A. SOV-77-3-5-9/21

TITLE: A Study of the Free Flight of Grains by the High-speed  
**Filming** Method (Issledovaniya svobodnogo poleta  
zern metodom vysokochastotnoy kinos"yemki)

PERIODICAL: Zhurnal nauchnoy i prikladnoy fotografii i kinematografii,  
1958, Vol 3, Nr 5, pp 368-376 (USSR)

ABSTRACT: For the purpose of the study a stream of grains was pro-  
jected from a rotating drum and belt into a special test  
chamber. The trajectory of the grains was recorded by  
high-speed photography. The grains were projected at a  
speed of up to 14 m/sec and the angle of departure could  
be adjusted as required. Two diffused-light arc lamps  
were used for lighting, and filming was carried out with  
an SKS-1 high-speed camera at 2,000-3,000 frames a sec.  
The trajectories of the grains were photographed in 4 sec-  
tions: the place of projection from the moving belt, the  
ascending, central and descending branches of the trajec-  
tory. When processed, the film was projected on to a  
screen covered with a sheet of thick paper and the posi-  
tion and outline of a given grain or grains was marked  
every 5 frames, thus showing the trajectory and any rotary  
movement of the grains. Formulae for the various parameters

Card 1/2

SCV-77-3-5-9/21

A Study of the Free Flight of Grains by the High-speed **Filming**  
Method

of the free flight of the grains are calculated and the defects and good points of the cinematic method of study are listed. The experimental data on grain speeds, angle of departure, rotary movements, etc, are given. No definite functional relationship was established between the progressive velocity of the grains, their angle of departure, the direction and rate of rotation in relation to their centers of gravity. The authors advise the use of stereoscopic high-speed cine-photography in future studies to fix the position of the grain in space. There are 2 photos, 2 figures, 1 schematic diagram and 2 Soviet references.

SUBMITTED: April 25, 1957

1. Seeds--Photography
2. Motion picture photography--Applications

Card 2/2



SMORODIN, Viktor Alekseyevich; KRIMERMAN, Petr Moiseyevich; ALEKSEYEVA,  
E.F., red.; BABICHEVA, V.V., tekhn.red.

[For the buyer of still and movie cameras] Pokupateliu o foto- i  
kinoapparatakh. Moskva, Gos.izd-vo torg.lit-ry, 1960. 86 p.  
(MIRA 13:11)

(Cameras)

KNUTSON, A.A.; STORODIN, V.A.

High-speed stereoscopic filming of a free flight of grain.

Usp. nauch. fot. 9:209 '64.

(MIRA 18:11)

SMORODIN, Yefim Markovich; S. BAKOV, Innocently Ivanovich;  
MAYLAKOV, G.S.; 1961.

[Preparing and using plastics in construction] Ingotov-  
lenie i primeneniye plastmass v stroitel'stve. Kiev,  
Budiveln'nyk, 1962. 21 p. (R.R. 16:1)

SMORODIN, Yu. A.

Self-quenching counting tubes with silver cathode. L. T. Baradzel and Yu. A. Smorodin (Moscow State Univ.). *J. Tech. Phys. (U.S.S.R.)* 16, 1400-70 (1946) (in Russian). —An all-glass counting tube is described whose cathode is chemically deposited Ag with a thin covering of Zapon lacquer. It is filled to a pressure of 8-10 cm. with a mixt. of 30%  $C_2H_4$  + 70% A. Its plateau runs from 1450 to 2000 v.; operation with a 0.6-3.0 megohm input resistance gives a  $10^{-4}$  —  $6 \times 10^{-3}$  sec. impulse. The tube performance is unaffected by temps. as high as 80°. Cyrus Feldman

SMORODIN, YU. A.

Nov 48

USSR/Nuclear Physics - Cosmic Rays  
Nuclear Physics - Particles

"Disintegrating Particles in the Composition of Cosmic Rays in the Stratosphere,"  
L. T. Baradzey, S. N. Vernov, Yu. A. Smorodin, Phys Inst imeni P. N. Lebedev,  
Acad Sci USSR, Moscow State U imeni M. V. Lomonosov, 2 pp

"Dok Ak Nauk SSSR: Voll.XIII, No 3

Up to 25-km altitude, measured intensity of radiation at a zenith angle of  $60^\circ$  and intensity of vertically-directed radiation in the stratosphere of penetrating 8 cm of lead. Difference in intensity for various zenith angles gave difference in the number of mesons disintegrating above the observation point. Registry of the number of coincidences in outer counters of the telescope and counters moved beyond its solid angle permitted establishing the number of rays. Submitted by Acad S. I. Vavilov 30 Sep 48.

PA 55/49T73

SMORODIN, Yu. A.

USSR

537.591.1

4661. An investigation of the non-ionizing component of cosmic rays in the stratosphere. V. S. ZARYA, Yu. A. SMORODIN AND Z. I. TULINOVA. Dokl. Akad. Nauk SSSR, 91, No. 3, 495-8 (1953) in Russian. English translation, U.S. National Sci. Found. NSF-tr-103.

The photon component has been studied by investigating the production of ionizing particles in a 1 cm lead plate carried aloft by balloons. It is concluded that the number of photons is ~50% of the number of electrons which agrees fairly well with the calculated value of 65%. H. ELLIOT

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1-PM

*Handwritten:* PM

Smorodin, Yu. A.

3223  
INTERACTION OF COSMIC RAY PROTONS WITH LIGHT  
NUCLEI ACCORDING TO MEASUREMENTS TAKEN WITH  
WILSON CHAMBER AT 9 KM ALTITUDE. I. T. Baradzel,  
V. I. Rubtsov, Yu. A. Smorodin, M. V. Solov'ev, D. V.  
Tolkachev, and Z. I. Tulinova. (Laboratory of Physics,  
Izvest. Akad. Nauk S.S.S.R. Ser. Fiz. 19, 602-7(1955) Sept.  
Oct. (in Russian))

The investigation of cosmic proton interaction with  
nuclei at high altitudes was facilitated by the high intensity  
of protons and negligible content of  $\pi$  mesons in the nuclear  
active component. The measurements of proton interactions  
with beryllium nuclei  $Be^9$  were made with a Wilson chamber  
of  $\phi$  200 mm and illumination depth of 500 mm. The  
chamber was working in a magnetic field with strength of  
5000 Oe. A beryllium plate of 5.3 g/cm<sup>2</sup> was placed in the  
chamber for measuring the space angles between the  
secondary particles and the primary particle traces over the  
plate. The measurement error for the space angles was  
within 1°. The particle angular distribution in the showers  
and the data on impulses are given. (R.V.J.)

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1-100

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SMORODIN, Yu. A.

56-7-3/66

AUTHOR

BARADZEY, L.T., RUBTSOV, V.I., SMORODIN, Yu.A., SOLOV'YEV, A.V.,  
TOCHKAYEV, B.V., TULIMOVA, Z.I.

TITLE

On the Formation of the Electron-Photon-Component in the Interaction  
between Cosmic Ray Particles with Energies Exceeding to  $10^{11}$  eV and  
Beryllium Nuclei

PERIODICAL

(Ob obrazovanii elektronno-fotonnoy komponenty pri vzaimodeystvii  
chastits kosmicheskikh luchey s energiyey vyshe  $10^{11}$  eV s yadrami  
berilliya. Russian)  
Zhurnal Eksperim. i Teoret. Fiziki, 1957, Vol 33, Nr 7, pp 17 - 20  
(U.S.S.R.)

ABSTRACT

The present paper describes the results of experiments carried out with  
a WILSON chamber which was fitted in a magnetic field. This WILSON cloud  
chamber operated for 52 hours in a height of 900 m. above this cloud  
chamber a beryllium block was located, in the interior of which a lead  
plate was fitted. On the occasion of the production of electron-photon  
showers in the absorbers the cloud chamber was photographed. 1490 pho-  
tographs were obtained and on 86 of them electronic-nuclear showers  
from the beryllium block were found recorded. Among them 5 electronic-  
nuclear showers were found in which more than 10 parts were observed.  
4 photographs of interactions are attached. The most important data on  
the showers investigated here are shown in a table. This table imparts

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56-7-3/66

On the Formation of the Electron-Photon-Component in the Interaction  
between Cosmic Ray Particles with Energies Exceeding to  $10^{11}$  eV and  
Beryllium Nuclei

ASSOCIATION      Physical Institute "P.N.Lebedev" of the Academy of Sciences of the  
                    U.S.S.R.  
                    (Fizicheskiy institut im. P.N. Lebedeva Akademii nauk SSSR)

PRESENTED BY  
SUBMITTED        6.2.1957  
AVAILABLE        Library of Congress

Card 3/3

*Smorodin Ya. A.*  
 AUTHORS: Baradzey, L. T., Rubtsov V.I., Smorodin Ya.A., 20-4-14/60  
 Solov'yev M.V., Telkachev B.V., Tulinova E.I.  
 TITLE: The Interaction of the Protons of Cosmic Rays With an Energy of  
 About 10 BeV With Lead-Nuclei (Vzaimodeystviye protonov kosmich-  
 eskikh luchey s energiyey okolo 10<sup>10</sup> eV s yadrami svintsa).  
 PERIODICAL: Doklady Akad.Nauk SSSR, 1957, Vol. 115, Nr 4, pp. 685-688 (USSR)  
 ABSTRACT: These investigations were performed in an altitude of 9000 m by  
 means of a cloud chamber in a magnetic field with 9200 oersteds.  
 The scheme for the control mechanism of the chamber is illustrat-  
 ed by a sketch. In order to exclude the interactions caused by  
 pions, the nuclear showers caused in the lead-plate by one indi-  
 vidual charged particle were investigated. Altogether 38 of those  
 case were selected, the characteristic photographs of the showers  
 are given. The maximum measured impulse of the charged particles  
 was 5 BeV/c. A table illustrates the distribution of the showers  
 on the number n of particles in the shower. The average number of  
 the particles per interaction is  $3.9 \pm 0.3$ . The experimental data  
 yield some indications concerning the chief components of the ele-  
 ctron-nucleus showers. A diagram illustrates the data of the en-  
 ergy distribution of the electrons. When this spectrum is descri-  
 bed by a law of the type  $dN/dE \sim E^{-\gamma}$ , the exponent  $\gamma$  is variable.  $\gamma \sim 1$   
 in the case of small energies and  $\gamma \sim 2.5$  in the case of energies of

Card 1/2

The Interaction of the Protons of Cosmic Rays With an Energy of  $\sim 10$  BeV With Lead-Nuclei. 20-4-14/60

$\sim 1$  BeV). Other diagrams illustrate the energy distribution of the protons and mesons. The electrons with an energy of  $> 2$  BeV spend about 160 MEV for the interaction. The summary energy of the electrons amounts to about 430 MeV per interaction. In the interactions examined here energy-rich particles are radiated which were hitherto not yet taken into consideration. The excess of particles with high energy can not be ascribed to the charged pions, but must come from protons. A proton with  $\sim 10$  BeV loses on the average  $2/3$  to  $1/2$  of its energy in the interaction with a lead-nucleus. The charged and the neutral pions carry away about  $1/3$  of the energy of the incident proton. The  $\delta$ -particles carry with them about the same amount of energy. There are 3 figures, 1 table and 5 references, 3 of which are Slavic.

ASSOCIATION: Moscow State University imeni M.V.Lomonosov.Physical Institute AN USSR imeni P.N.Lebedev (Moskovskiy gos. universitet imeni M.V. Lomonosova,Fizicheskiy institut imeni P.N.Lebedeva AN SSSR).  
PRESENTED: March 5, 1957 by D.V.Skobel'tsyn, Academician  
SUBMITTED: December 21, 1956  
AVAILABLE: Library of Congress.

Card 2/2

SMORODIN, Yu. A. Cand Phys-Math Sci -- (diss) "Study of the interrelation  
of cosmic-ray protons and beryllium nuclei <sup>by means</sup> ~~with the help~~ of Wilson <sup>chamber</sup> ~~cameras~~."  
Mos. 1958. 11 pp (Acad Sci USSR. Physics Inst im P. N. Lebedev), 125 copies.  
(KL, 14-58, 109)

-9-

S/627/60/002/000/006/027  
D299/D304

3,2410 (2295, 2705, 2805)

AUTHORS: Antenov, R. A., Smorodin, Yu. A., and Tulinova, Z. I.

TITLE: Air showers at an altitude of 9-12 km

SOURCE: International Conference on Cosmic Radiation. Moscow, 1959. Trudy. v. 2. Shirokiye atmosferye livni i kas-kadnyye protsessy, '01-106

TEXT: The density spectrum of extensive air showers was studied by means of hodoscoped counters, whose disposition is shown in a figure. In one of the experiments, a system of ionization chambers operated in conjunction with the hodoscope. In order to obtain the density spectrum of the showers, the mean density  $\rho$  of a shower was determined at all the counters jointly. Such a method of determining  $\rho$  reduces the effect of local electron-density fluctuations. The passage from the distribution according to the number of operating counter  $n_m$  to the density spectrum, was effected by means of the integral equation

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31524  
S/627/60/002/000/006/027  
D299/D304

Air showers at an ...

$$I_{40}^m = \int_0^{\infty} C_{40}^m (1 - e^{-\rho\sigma})^m e^{-\rho\sigma(40-m)} \frac{dH}{dp} dp$$

4

where  $\sigma$  is the area of a counter and  $dH/dp$  - the sought for differential density-spectrum; taking as the zeroth approximation  $dH/dp = f(\sigma p)(\sigma p)^{-2.5}$ , one obtains

$$I_{40}^m = f(\sigma p)_{\max} \int_0^{\infty} (\sigma p)^{-2.5} (1 - e^{-\rho\sigma})^m e^{-\rho\sigma(40-m)} d(\sigma p) = f(\sigma p)_{\max} S(m)$$

A figure shows the differential density-spectra for showers at sea

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31524  
S/627/60/002/CLO 006.007  
D299/D304

Air showers at an ...

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR (Physics Institute im. P. N. Lebedev AS USSR); Nauchno-issledovatel'skiy institut yadernoy fiziki VNIIE (Scientific Research Institute of Nuclear Physics Moscow State University)

4

Card 4/4

24(5)

AUTHORS:

Birger, N. G., Smorodin, Yu. A.

SOV/56-36-4-30/70

TITLE:

On the Kinematics of Elementary Interactions (O kinematike elementarnykh vzaimodeystviy)

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959,  
Vol 36, Nr 4, pp 1159-1167 (USSR)

ABSTRACT:

The investigation of the interaction between high-energy particles ( $>10^9$ ev) and nucleons and nuclei meets with difficulties caused by the following two main reasons: As no complete theoretical description of the interaction processes is available, the existing experimental material cannot be analyzed according to uniform points of view; the experimental devices used today for the purpose of investigating the interaction of fast particles (cosmic radiation, accelerator) do not render a complete determination of the processes observed possible. The object of the present paper is the consideration of some kinematic methods of analyzing nuclear interactions of fast particles. This analysis furnishes individual partial process characteristics which are free from representations using the similarity method (model representations). By employing the theorems of conservation, the authors derive a

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On the Kinematics of Elementary Interactions

SOV/56-36-4-30/70

number of interaction relations; thus, an expression is given for the number  $k$  of particles contained in a given solid angle for the case in which, in the c.m.s., the nucleons fly off isotropically. Also for  $k_{\max}$  a formula is derived. The relations obtained are finally applied to experimental data. The analysis of such interactions observed in cloud chambers and photographic emulsions in the c.m.s of the colliding particles (of tables 1 and 2) supplies angular and energy characteristics of the interactions. The results obtained by these investigations are discussed in detail. The authors thank the staff members of the Laboratoriya kosmicheskikh luchey FIAN (Laboratory for Cosmic Radiation of the Physics Institute of the AS) and of the NIIYaF (Scientific Research Institute for Nuclear Physics) for discussions. There are 5 figures, 2 tables, and 13 references, 7 of which are Soviet.

ASSOCIATION:

Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR  
(Physics Institute imeni P. N. Lebedev of the Academy of Sciences, USSR)

Card 2/3

3.2410

S/058/61/000/010/018/100  
A001/A101

AUTHORS: Birger, N.G., Slavatinskiy, S.A., Smorodin, Yu.A.

TITLE: On one peculiarity of interaction of particles with average energy of 200 Bev

PERIODICAL: Referativnyy zhurnal. Fizika, no. 10, 1961, 96, abstract 10B502  
("Tr. Mezhdunar. konferentsii po kosmich. lucham, 1959, v. 1", Moscow, AN SSSR, 1960, 154 - 156)

TEXT: Kinematical method of analysis is applied to investigations of interactions of particles with average energy of 200 Bev. The method makes it possible to determine effective mass of the target nucleus.

[Abstracter's note: Complete translation]

Card 1/i

24.6700

3.2410 (2705, 2805, 1559)

31531  
S/627/60/002/000/013/027  
D299/D304

AUTHORS: Baradzey, L. T., Rubtsov, V. I., Smorodin, Yu. A., Solov'yev, M. V. and Tolkachev, B. V.

TITLE: Absorption of high-energy nucleons in the atmosphere

SOURCE: International Conference on Cosmic Radiation. Moscow, 1959. Trudy. v. 2. Shirokiye atmosferynye livni i kas-kadnyye protsessy, 152-158

TEXT: The apparatus which was installed in an aircraft permitted studying large ionization bursts at various depths in the atmosphere:  $p = 200 \text{ gm/cm}^2$ ,  $p = 310 \text{ gm/cm}^2$ ,  $p = 1020 \text{ gm/cm}^2$ . The apparatus incorporated ionization chambers and hodoscoped counters. The energy spectrum of the electron-photon component was obtained, for energies of  $2 \cdot 10^{10}$  to  $2 \cdot 10^{12}$  ev. It was found that in most cases the energy of the electron-photon component collimates well around the shower axis which lies in the area of the ionization chambers. A table shows the mean ionization-distribution in the chambers. The fast drop in energy density with distance from the shower axis

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Absorption of high-energy ...

31531  
S/627/60/002/000/013/027  
D299/D304

shows that the recorded events are cascade showers of primary particles, namely gamma-quanta showers formed by the decay of  $\pi^0$ -mesons. The differential spectra of the electron-photon component show that for energies of  $2 \cdot 10^{10}$  to  $2 \cdot 10^{12}$  ev. the spectrum can be approximated by a power law with exponent  $\tau = 2.75 \pm 0.07$  for all the altitudes under consideration. The electron energy spectrum for the one-dimensional problem was calculated in the approximation A which is sufficient for the small distances from the shower axis involved. The exponential change in atmospheric density was taken into account by means of Greisen's approximate method (Ref. 1: Fizika kosmicheskikh luchey (translation into Russian of "Progress in Cosmic Ray Physics", edited by J. G. Wilson), v. 3, chapt. 1, IL, 1958). The differential energy spectrum of the electron-photon component is

4

$$\frac{dN}{dE} = AE^{-\epsilon} \int_0^{\infty} \alpha(t, E) \epsilon^{-1} \left( 1 - \frac{\partial \ln \alpha}{\partial \ln E} \right) e^{\frac{t}{u}} dt = AE^{-\epsilon} C(E, P) \quad (2)$$

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Absorption of high-energy ...

31531  
S/627/60/002/000/013/027  
D299/D304

where C is the thickness of the effective layer for photon generation. Thereupon, the photon generation spectrum is obtained. The absorption length of the component which generates photons of energy  $10^{11}$  to  $10^{12}$  ev. is  $120 \text{ gm/cm}^2$ . Further, the energy of the nuclearactive particles is estimated which generate the photons. It was found that at pressures of 200 and  $310 \text{ gm/cm}^2$ , the electron density drops in accordance with the law  $r^{-0.7 \pm 0.1}$ , up to distances of 10 m from the ionization chambers. This table shows also the values of the energy of nuclearactive particles. It was established that the photons are generated by nuclearactive particles, whose energy is a hundredfold the energy of the photons. The study of electron-photon cascades at high altitudes, where the effective recording-layer is small, permits investigating the generation of the electron-photon component by the interaction of nuclearactive particles with energies of  $10^{13} - 10^{14}$  ev., with light nuclei. The absolute intensity of the nuclearactive component was obtained on the assumption that on interacting with the carbon nucleus, the

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Absorption of high-energy ...

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S/627/60/002/000/013/027  
D299/D304

high-energy nucleon transmits 10% of its energy to the  $\pi^0$ -mesons. The conclusion was reached that the absorption length of nuclearactive particles with energies of  $10^{11}$  to  $10^{13}$  ev. does not change, remaining close to 120 gm/cm<sup>2</sup>. In this energy range, the spectrum of the primary cosmic particles is

$$N(>E) = 900 \left( \frac{E}{10^{12}} \right)^{-1,5} \frac{\text{particle}}{\text{m}^2 \text{ hour sterad}} \quad (4)$$

The relation between the differential spectrum of the nuclearactive component (expressed by  $E_0^{-\gamma}$ ), the differential spectrum of the generated  $\pi$ -mesons ( $E^{-\varepsilon}$ ), and the energy of the  $\pi$ -mesons (following the law  $E_\pi = \text{const} \cdot E_0^\beta$ ), yields the formula

$$\beta = \frac{\gamma - 2}{\varepsilon - 2} \quad (5)$$

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84424

S/056/60/039/004/042/048  
B006/B056

3,1800 (1041,1062,1168)

24.6900

AUTHORS:

Nikol'skiy, S. I., Smorodin, Yu. A.

TITLE:

Interpretation of Experimental Data on the Spectrum of  
Electron-Photon Cascades Having Energies  $> 10^{12}$  ev in the  
Upper Strata of the Atmosphere

PERIODICAL:

Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960,  
Vol. 39, No. 4(10), pp. 1156 - 1157

TEXT: At the International Conference on Cosmic Radiation (Moscow 1959) a report was given on the original results obtained for the energy spectrum of electron-photon cascades at an altitude of 10 - 12 km. It was found that the energy spectrum of these cascades deviates considerably from the energy spectrum of primary cosmic radiation within the corresponding energy range ( $\sim E^{-4}$  dE and  $\sim E^{-2.7}$  dE, respectively). As the assumption discussed at the conference that the energy fraction transferred in the electron-photon component decreases with growing interaction energy of the particles is not applicable to the data of extensive air

Card 1/3

84424

Interpretation of Experimental Data on the Spectrum of Electron-Photon Cascades Having Energies  $> 10^{12}$  ev in the Upper Strata of the Atmosphere S/056/60/039/004/042/048 B006/B056

showers. the authors try to explain the data of energy spectra in a different way; they assume that the character of the elementary events of particle interaction at an energy from  $10^{14}$  to  $3 \cdot 10^{14}$  ev changes. The authors calculated the total energy flux carried away by electrons and photons with energies higher than  $10^{12}$  ev at an altitude of 10 - 12 km. The corresponding experimental data are given in a figure by circles (photoemulsion data) and squares (ionization chamber data). The total energy flux carried away by electrons and photons of energies  $> 10^{12}$  ev is, if recording is done by ionization chambers, higher than when determined in photoemulsions. In order to determine the experimentally observed total energy flux, it is necessary to extrapolate for high energies. If, on this occasion, it is assumed that the energy spectra retain their shape, the energy fluxes measured by the photoemulsion method are higher than those determined by means of ionization chambers. Agreement of experimental data may be obtained only by assuming that a large part of the electrons and photons with  $E > 10^{12}$  ev, which are observed in

Card 2/3



Interpretation of Experimental Data on the Spectrum of Electron-Photon Cascades Having Energies  $> 10^{12}$  ev in the Upper Strata of the Atmosphere

S/056/60/039/004/042/048  
B006/B056

photoemulsions, occur in large groups. The energy spectrum of these groups has, if recorded by ionization chambers, a stepped course (cf. Fig.). This is briefly discussed. Finally, the statistical model of interaction processes at energies  $> 10^{14}$  ev is discussed, and some difficulties are pointed out. The authors thank L. T. Baradzey, V. I. Rubtsov, M. V. Solov'yev, and B. V. Tolkachov for making data available. There are 1 figure and 5 Soviet references.

ASSOCIATION: Fizicheskii institut Akademii nauk SSSR (Institute of Physics of the Academy of Sciences USSR)

SUBMITTED: July 7, 1960

Card 3/3

CHERNOZH, YU. A., BLAGIN, N. G.

"On the Interactions of Mesons and Nucleons."

report submitted for the Intl. Conf. on Cosmic Rays and Earth Storm (IUPAC)  
Kyoto, Japan 4-15 Sept. 1961.

BIRGER, N.G.; VAN GAM-CHAN [Wang Kang-ch'ang]; VAN TSU-TSZEN [Wang TS'u-tsêng];  
DIN DA-TSAO [Ting Ta-ts'ao]; KATYSHEV, Yu.V.; Kladnitskaya, Ye.N.;  
KOPYLOVA, D.K.; LYUBIMOV, V.B.; NGUYEN DIN TY; NIKITIN, A.V.;  
PODGORETSKIY, M.I.; SMORODIN, Yu.A.; SOLOV'YEV, M.I.; TRKA, Z.

Inelastic interactions of 6.8 BeV./c  $\pi^+$ -mesons with nucleons.  
Zhur. eksp. i teor. fiz. 41 no.5:1461-1474 N '61. (MIRA 14:12)

1. Ob'yedinennyi institut yadernykh issledovaniy.  
(Collisions (Nuclear physics))  
(Mesons) (Nucleons)

3.24/0 (2205, 2705, 2805)

S/048/52/026/005/004/022  
B105/B104

AUTHORS: Baradzey, L. T., Rubtsov, V. I., Smorodin, Yu. A.,  
Solov'yev, M. V., and Tolkachev, B. V.

TITLE: Formation of an electron-photon component in the interaction  
of particles of  $10^{12}$ - $10^{14}$  ev with light nuclei in the  
atmosphere

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 26,  
no. 5, 1962, 575-584

TEXT: With the aid of ionization chambers with an area of  $0.2 \text{ m}^2$ , the  
authors obtained data on: (1) the energy spectra of electron-photon  
avalanches falling upon the apparatus from the air at pressures of 200, 300,  
and  $1050 \text{ g/cm}^2$ ; (2) the energy spectra of cascades induced by nuclear-  
active particles in the graphite block above the apparatus at pressures of  
200 and  $300 \text{ g/cm}^2$ ; (3) the air showers accompanying the particles. The  
particle densities in the showers were determined immediately at the

Card 1/3

Formation of an electron-photon...

S/048/62/026/002/004/022  
B108/B104

apparatus and 10 m away from it. The major part of photons is produced by particles of an energy exceeding the photon energy by one order of magnitude. The photon spectra at high energies (above  $2 \cdot 10^{12}$  ev) differ considerably from those obtained at low energies. This is probably due to increased energy dissipation by new secondary radiation processes. The absorption path of nuclear-active particles in the atmosphere can be determined from the absorption path of the component producing the electromagnetic cascade in the light substance, or from the absorption path of the component producing high-energy photons in the atmosphere. The coefficient of inelasticity of nucleon interaction remains unchanged over a wide range of energies. The intensity of primary cosmic radiation in the energy range  $2 \cdot 10^{11} - 2 \cdot 10^{13}$  ev is

$$N(>E) = (600 \pm 150)(E/10^{12})^{-1.7 \pm 0.15} \text{ hr}^{-1} \text{ m}^{-2} \text{ sterad}^{-1}.$$

This spectrum is consistent with results of more accurate calculations. There are 9 figures and 3 tables.

Card 2/3

.. ANTONOV, Yu. A. SMORODIN, Z. I. TULINOVA

Evolution of vertical EAS in the upper atmosphere

Report submitted for the 8th Intl. Conf. on Cosmic Rays (IUPAP), Jaipur India,  
2-14 Dec 1963

. BARADZEY, V. I. RUBISOV, Yu. A. SMORODIN, M. V. SOLOVYEV

Absorption of High Energy Nucleons in the Atmosphere and Production of Mesons

Report submitted for the 8th Intl. Conf. on Cosmic Rays (IUPAP), Jaipur, India,  
2-14 Dec 1963

S/056/63/044/002/010/065  
B102/B186

AUTHORS: Rubtsov, V. I., Smorodin, Yu. A., Tolkachev, B. V.  
TITLE: The mean free path of  $\sim 10^{12}$  ev nucleons in carbon  
PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 44,  
no. 2, 1963, 462-468

TEXT: The mean free paths of cosmic nucleons in the  $10^{12}$  ev range were determined for carbon at altitudes of 9 and 12 km. The experimental apparatus brought into these regions by an aeroplane, consisted of (from top to bottom): a graphite lump ( $325 \text{ g/cm}^2$ ), a lead plate ( $25 \text{ g/cm}^2$ ), a row of ionization counters (for the electron-photon showers), an aluminum lump ( $66 \text{ g/cm}^2$ ), lead ( $19 \text{ g/cm}^2$ ), another row of counters, lead ( $19 \text{ g/cm}^2$ ), counters, and again lead ( $25 \text{ g/cm}^2$ ). The total ionizations of the three chamber rows were recorded by a cylindrical ionization chamber (10.55 cm) filled with Ar to 6 atm. Its anodic pulses were amplified ( $f = 1.5 \cdot 10^5$ ) and fed to oscilloscopes. For the second and third counter rows the lower limits of recording were made at 200 and 400 electrons, respectively. After a very careful determination of all  
Card 1/2



S/056/63/044/002/010/065  
B102/5166

The mean free path of ...

possible processes affecting the measurements and a correction for the background, the mean free path for inelastic nucleon interactions at  $10^{12}$  ev in carbon was found to be  $92_{-8}^{+12}$  g/cm<sup>2</sup>. This value agrees with that found for nucleons of the  $10^{10}$  ev range. The cross-section corresponding to this path length is  $\sigma_0 = 33 \pm 7$  mb; this value agrees with that measured for  $2.5 \cdot 10^{10}$  ev (Cocconi, Proc. of the Conf. CERN, 1961). There are 3 figures and 5 tables.

ASSOCIATION: Fizicheskii institut im. P. N. Lebedeva Akademii nauk SSSR  
(Physics Institute imeni P. N. Lebedev of the Academy of Sciences USSR)

SUBMITTED: August 9, 1962

Card 2/2

ACCESSION NR: AP4009107

S/0056/63/045/006/1865/1874

AUTHORS: Antonov, R. A.; Smorodin, Yu. A.; Tulinova, Z. I.

TITLE: Altitude variation of vertical extensive air showers in the upper part of the atmosphere

SOURCE: Zhurnal eksper. i teoret. fiziki, v. 45, no. 6, 1963, 1865-1874

TOPIC TAGS: extensive air shower, cosmic rays, cosmic radiation, air shower flux, vertical air shower flux, shower particle lateral distribution, Gross transformation, particle number spectral exponent, cascade parameter, electron photon component

ABSTRACT: Experiments have been performed in the upper part of the atmosphere to obtain data on the fluxes and spectra of vertical extensive air showers and also on the lateral distribution of the shower particles. Another purpose of the investigations was to check on the validity of the generalized Gross transformation for vertical showers, to check the particle-number spectral exponent, and to determine the cascade parameter. The experimental counter array used

Card 1/2

ACCESSION NR: AP4009107

for the purpose is described. The altitude variation of showers with  $\sim 10^6$  particles, obtained on the basis of the experimental results, indicates that the particles with energy  $\sim 10^{15}$  eV, which initiate these showers, experience a high energy dissipation in the interactions. A considerable fluctuation in the mechanism of energy transfer in the electron-photon component of the shower is also indicated. "The authors take the opportunity to express deep gratitude to S. N. Vernov for help with the research." Orig. art. has: 8 figures, 15 formulas and 2 tables.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR  
(Physics Institute, AN SSSR)

SUBMITTED: 21Jun63

DATE ACQ: 02Feb64

ENCL: 01

SUB CODE: PH

NO REF SOV: 009

OTHER: 009

Cord 2/17

ACCESSION NR: AP4025907

on the peripheral reaction of nucleons. Of great interest was the paper of S. Skrzypczak (Warsaw) on the interaction between the  $24 \text{ GeV}$  protons and  $16 \text{ GeV}$   $\pi$ -mesons with the heavy photoemulsion nuclei. These experiments were carried out according to a new and very promising method. A number of papers covered the study of the resonance systems - quasiparticles ( $\rho$ -,  $\omega$ -,  $\eta$ -mesons) and of isobars. Among these papers were the reports of K. Lanius (Berlin) and T. Hofmaki (Warsaw). The problem of main interest was centered on the existence of reactions which cannot be described by one-meson diagrams. This topic was dealt with in the report presented by Ye. L. Feinberg (Moscow). The high-energy physics ( $10^{15}$ - $10^{16}$  ev) was represented by the works of Polish, Bulgarian, Hungarian, and Soviet groups. A. Zavadski (Lodz) reported on the detection of photons in primary cosmic radiation. A. Shomogyi (Budapest) spoke on the measurement of extended air shower densities ( $1000 \text{ particles/m}^2$ ). Soviet physicists discussed the investigations of  $\mu$ -mesons in the extended air showers (B. A. Khrenov), high-energy photons from cosmic sources, the Cherenkov glow (N. M. Nesterova), and the development of the showers in the upper third of the atmosphere (Yu. A. Smorodin).

ASSOCIATION: none

Card 2/3

L 24814-65 EWG(j)/EWT(m)/FCC/T IJP(c)

ACCESSION NR: AT4049953

S/2504/64/026/000/0142/0165

AUTHOR: Antonov, R.A.; Smorodin, Yu. A.; Tulinova, Z.I.

TITLE: Experimental data on the development of extensive air showers in the upper half of the atmosphere

SOURCE: AN SSSR. Fizicheskiy institut. Trudy\*, v. 26, 1964. Kosmicheskiye luchy (Cosmic rays), 142-165

TOPIC TAGS: air shower, upper atmosphere, gamma quantum, electron photon cascade, Landau theory, Heisenberg fireball

ABSTRACT: Two questions are resolved on the basis of experimental data: the height dependence of vertical extensive air showers and the formation of  $\gamma$ -quanta in extensive air showers. A discussion of the first question contains sections entitled: 1. methods of isolating vertical showers; 2. density spectra of extensive air showers; 3. global height dependence and height dependence of vertical extensive air showers; 4. radial distribution of particles in showers; 5. height dependence of vertical showers with a given number of particles. The discussion of the second question has sections entitled: 1. electron-photon cascades in extensive air showers; 2. calculation of the total number of high-energy

Card 1/3

L 24814-65

ACCESSION NR: AT4049953

2/

$\gamma$ -quanta in extensive air showers of a given power; 3. experimental results; 4. spectra of high-energy  $\gamma$ -quanta in extensive air showers of a given power. The following conclusions are drawn: 1. The degree of energy dissipation in the formation of pions in nuclear interactions contributing at the outset to showers with energies of about  $10^{15}$  ev is high. The major portion of the energy is given over to pions with energies of about  $10^{12}$  ev. This is evidenced both by data on the average number of  $\gamma$ -quanta with energies  $E > 10$  ev incipient in the atmosphere in layers of 197 and 311 g/cm<sup>2</sup>, and by the maximum height of showers with  $N > 10^6$ ; 2. The degree of energy dissipation is significantly higher than predicted by the Landau theory and close to the maximum value which follows from the Heisenberg fireball model; 3. There are fluctuations in the mechanism of energy transfer to the electron-photon component of the shower. This is evidenced by the significant extent of the maximum of the vertical variation of showers with  $N > 10^6$ ; 4. It is advisable that the average characteristics of extensive air showers in the upper third of the atmosphere be studied since cascade development of showers contributes little at these heights and hence, experimental characteristics can be compared directly with characteristics of high-energy nucleon interactions contributing at the outset of the shower. "The authors express thanks to S. N. Bernov for help in conducting the study. The work on ionization was carried out by M. V. Solov'yev." Orig. art. has: 20 figures, 6 tables and 17 formulas.

Card 2/3

L 24814-65

ACCESSION NR: AT4049953

ASSOCIATION: Fizicheskly institut AN SSSR (Physics Institute, AN SSSR)

SUBMITTED: 00

ENCL: 00

SUB CODE: AA

NO REF SOV: 015

OTHER: 010

Card 3/3

L 24662-65 EWT(m)/ DIAAP  
ACCESSION NR: AT4049957

S/2504/64/026/000/0224/0248

23  
26  
B+1

AUTHOR: Baradzey, L. T.; Rubtsov, V. I.; Smorodin, Yu. A.; Solov'yen, M. V.;  
Tolkachev, B. V.

19  
TITLE: Passage of high-energy nucleons through the atmosphere and the formation of mesons

SOURCE: AN SSSR. Fizicheskii institut. Trudy\*, v. 26, 1964. Kosmicheskiye luchy (Cosmic rays), 224-248

TOPIC TAGS: cascade multiplication, pion, nucleon, meson, avalanche, muon, gamma quantum, high energy particle

ABSTRACT: An analysis is made of recently collected data on the passage of  $10^{12} - 10^{14}$  ev nucleons through the atmosphere. Energies of electron-photon cascade were measured with instruments which recorded ionization bursts resulting from an avalanche in a lead filter. The three instruments used are described. The energy spectra of nuclear cascades are discussed, taking into account shortening of the spectrum of primary nucleons in the form

$$N(>E) = 500(E)^{-1.7} [-0.15 + 2.75(E)^{-0.5} - 1.6(E)^{-0.4}] \text{ nucleon/hr.m}^2\text{.ster} \quad (1)$$
  
where the effective fraction of energy conversion is close to 0.5 and the fraction of energy

Card 1/3



L 24662-65

ACCESSION NR: AT4049957

transferred to the electronphoton component during interaction with nuclei of the air  $\Delta_{e-p}$  is such that

$$\int_0^1 \Delta_{e-p}^{1.7} / (\Delta_{e-p}) d\Delta_{e-p} = 0,08 \pm 0,02 = 0,22^{+0.02}_{-0.02}. \quad (2)$$

Data on the flux of nuclear-active cosmic-ray components at various atmosphere depths is summarized. Energy spectra of electron-photon avalanches incipient in the atmosphere and generation of  $\gamma$ -quanta are discussed. The formation of pions and pion fluxes in the atmosphere is treated. The fraction of energy carried by  $\pi^+$ -mesons generated in the energy range below  $10^{14}$  ev is expressed as

$$\int_0^1 \Delta_{\pi^+}^{1.7} / (\Delta_{\pi^+}) d\Delta_{\pi^+} = 0,033 \pm 0,007 = 0,14^{+0.007}_{-0.007}. \quad (3)$$

Calculation of charged pion flux indicates that the generation of mesons of different sign may be expected at energies of about  $10^{11}$  ev. It also indicates that in the  $10^{11} - 2 \cdot 10^{12}$  ev range pions make a significant contribution to nuclear-active components of the flux. About half of the nuclear cascades of a given energy and generated in thin filters are formed in the lower third of the atmosphere by  $\pi^+$ -mesons. Muon flux at sea level calculated from data on atmospheric generation of  $\gamma$ -quanta coincides with experimental values in the  $10^{11} - 2 \cdot 10^{12}$  ev range, indicating that the overwhelming fraction of muons in the atmosphere results from the decay of pions. "The authors

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L 24662-65

ACCESSION NR: AT4049957

thank S.N. Vernov for his constant help, as well as R.A. Antonov for carrying out the godoscopic studies." Orig. art. has: 12 figures, 9 tables and 29 formulas. 2

ASSOCIATION: Fizicheskly Institut AN SSSR (Physics Institute, AN SSSR)

SUBMITTED: 00

ENCL: 00

SUB CODE: AA

NO REF SOV: 028

OTHER: 018

Card 3/3

L 16016-65 EWT(m) DIAAP/AFWL/SSD  
ACCESSION NR: AP4049588

S/0048/64/028/011/1807/1811

AUTHOR: Baradzey, L. T.; Rubtsov, V. I.; Smorodin, Yu. A.;  
Solov'yev, M. V. B

TITLE: Passage of <sup>19</sup>high-energy nucleons through the atmosphere and the formation of mesons. [Report presented at the Vsesoyuznoye soveshchaniye po fizike kosmicheskikh luchey (All-Union Conference on Cosmic Rays), held in Moscow from 4 to 10 October 1963]

SOURCE: AN SSSR. Izv. Seriya fizicheskaya, v. 28, no. 11, 1964, 1807-1811

TOPIC TAGS: primary nucleon, cascade spectrum, nuclear component, terrestrial atmosphere, energy nuclear cascade, electron photon component, meson, pion

ABSTRACT: The spectrum of the primary nucleons in meson generation becomes sharper than the cascade spectra. The absorption of the active nuclear component in the terrestrial atmosphere may be determined by the ratio of the energy of secondary particles to the energy of the primary component, neglecting the magnitudes of these energies. The

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L 16016-65

ACCESSION NR: AP4049588

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flux of the active nuclear component in the atmosphere at a depth  $t$  may be computed by using formulas for high energies and comparing the results with spectra of the nuclear cascades. The part of the energy transferred to the electron-photon component during the nuclear interaction is  $0.22^{+0.01}_{-0.01}$ . This result makes it possible to assume that the generation of  $\pi^0$ -mesons with energies of  $10^{11}$ — $10^{13}$  eV is proportional to the energy of active nuclear particles. The formation of  $\pi^+$  and  $\pi^-$  mesons may resemble the formation of  $\pi^0$  mesons, and the probability of all generated pions is  $0.26^{+0.01}_{-0.01}$ . An analysis of the data obtained shows that  $\pi^0$  mesons are associated with showers whose energy is 10 times that of the  $\pi^0$  meson energy. Orig. art. has: 2 figures, 5 formulas, and 2 tables.

ASSOCIATION: Nauchno-issledovatel'skiy institut yadernoy fiziki Moskovskogo gosudarstvennogo universiteta im. M. V. Lomonosova (Scientific Research Institute of Nuclear Physics of the Moscow State University); Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Institute of Physics, Academy of Sciences, SSSR)

Card 2/3

L 16016-65

ACCESSION NR: AP4049588

SUBMITTED: 00

ENCL: 00

SUB CODE: ES

NO REF SOV: 012

OTHER: 012

ATD PRESS: 3142

Card 3/3



ANTONOV, R.A.; SMORODIN, Yu.A.; TULINOVA, Z.I.

Formation of high-energy  $\gamma$ -quanta in extensive air showers  
with energies of  $10^{14}$  to  $10^{15}$  ev. in the upper third of the  
atmosphere. Zhur. eksper. i teor. fiz. 46 no.1:28-35 Ja'64.  
(MIRA 17:2)

1. Fizicheskiy institut imeni P.N. Lebedeva AN SSSR.

L 4477-66	ENT(1)/EWT(m)/FCC/T/EWA(h)	LJP(c) GW
ACC NR: AP5024619	SOURCE CODE: UR/0048/65/029/009/1627/1630	
AUTHOR: Dobrotin, N.A.; Zelevinskaya, N.G.; Kotel'nikov, K.A.; Maksimenko, V.M.; Puchkov, V.S.; Slavutinskiy, S.A.; Smorodin, Yu. A.		
ORIG: none		
TITLE: Phenomenological picture of secondary particle production in nucleon interactions at hundreds and thousands of BeV. /Report, All-Union Conference on Cosmic Ray Physics held at Apatity 24-31 August 1964/		
SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 9, 1965, 1627-1630		
TOPIC TAGS: primary cosmic ray, secondary cosmic ray, pi meson, high energy particle, particle production		
ABSTRACT: The authors briefly review the experimental data on secondary particle production by primary cosmic rays. The inelastic interaction cross section is practically constant for energies from 20 to 10 <sup>5</sup> BeV, and the inelasticity is constant and equal to 0.4-0.5 for energies up to 10 <sup>4</sup> BeV. About 90% of the secondaries are pions. Two production mechanisms are distinguished: fireball production, and production and decay of excited nucleons (isobars). Most of the secondaries are produced by the fireball mechanism. In the hundred BeV range there is a reference system in which the pions are emitted isotropically. In this system the pion energy distribution can be represented, except for a high-energy tail, by a Bose-Planck function for a temperature of 0.7-1.0		
Card	1/2	09010321



L 4477-66

ACC NR: AP5024619

pion masses. In the thousand BeV region there are indications that two or more fireballs may be produced. The high-energy tail on the pion energy distribution is ascribed to decay of highly excited isobar states. It is shown that the exponents in the atmospheric energy spectra of nuclear-active particles and of high-energy photons (ascribed to pion decay) are very nearly the same. From this it is concluded that the energies of the high-energy pions are proportional to the energies of the primaries producing them. Only a few (one or two) high energy pions are produced in each interaction, and these carry 10-20 % of the incident particle energy. It is anticipated that counter installations now under construction will provide more accurate data on both pion production mechanisms in the thousand VeV range. Orig. art. has: 6 formulas, 2 figures, and 1 table.

SUB CODE: NP/ SUBM DATE: 00/

ORIG REF: 007/ OTH REF: 009

PC

Card 2/2

L 4474-66 EWT(1)/EWT(m)/FCC/T/EWA(h) IJP(c) GW  
ACC NR: AP5024645

SOURCE CODE: UR/0048/65/029/009/1728/1730

AUTHOR: Antonov, R.A.; Smorodin, Yu.A.; Tulinova, A.I.

ORG: none

TITLE: On the width of the maximum of the altitude dependence curve for extensive air showers /Report, All-Union Conference on Cosmic Ray Physics held at Apatity 24-31 August 1964/

SOURCE: AN SSSR. Izvestiya. Seriya fizicheskaya, v. 29, no. 9, 1965, 1728-1730

TOPIC TAGS: primary cosmic ray, secondary cosmic ray, extensive air shower, nucleon interaction, inelastic interaction

ABSTRACT: Using recent experimental data from several sources on the absolute incidence rates of extensive air showers of different strengths at different altitudes, the authors have constructed isoincidence curves for rates of 10-9, 10-10, and 10-11 shower axes/cm<sup>2</sup> sec sterad on a log N versus t plot (N is the number of particles in the shower and t is the depth in the atmosphere). If there were no fluctuations in the shower development process, these curves would represent the development in the atmosphere of showers of different strengths. The fluctuations are discussed and it is concluded that they are not more significant than the ~ 30 % experimental error. The isoincidence curves are characterized by broad maxima, which extend nearly from

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0901 0373

REF ID: A66031437  
ACC NR: AP6031437

SOURCE CODE: UR/0056/66/051/002/0431/0444

AUTHOR: Smorodin, Yu. A.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences SSSR (Fizicheskiy institut Akademii nauk SSSR)

TITLE: Elimination of some inconsistencies in data on cosmic rays with energies above  $10^{11}$  ev based on the assumed existence of a passive nucleon state

SOURCE: Zh eksper i teor fiz, v. 51, no. 2, 1966, 431-444

TOPIC TAGS: cosmic ray, nucleon, baryon, cosmic ray interaction, high energy interaction

ABSTRACT: It is shown that a number of inconsistencies in the experimental data on interaction between cosmic-ray nucleons with energies  $\geq 10^{11}$  ev can be removed on the assumption that after interaction the nucleon is left in a passive state in which the nuclear interaction cross section is smaller than the normal cross section. Analysis of the experimental data pertaining to a broad energy range from  $10^{11}$  to  $10^{16}$  ev yields a single lifetime for baryons in the passive state. The value of the lifetime is  $\approx 10^{-10}$  sec, the characteristic time for processes associated with a change of parity in weak interactions. Estimations of the transition probability and cross section for baryon interaction in the passive state are discussed. Orig. art. has: [CS]  
10 formulas and 9 figures.

SUB CODE: 03.20 SUBM DATE: 12Nov65/ ORIG REF: 019/ OTH REF: 013/ ATD PRESS:  
Card 1/1, 5083

ACC NR: AP6010433

SOURCE CODE: UR/0386/66/003/005/0197/0201

AUTHOR: Smorodin, Yu. A.

ORG: Physics Institute im. P. N. Lebedev, Academy of Sciences, SSSR (Fizicheskii institut Akademii nauk SSSR)

TITLE: On the possibility of existence of a passive baryon<sup>19</sup> state

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu. Prilozheniye, v. 3, no. 5, 1966, 197-201

TOPIC TAGS: baryon, extensive air shower, cosmic ray particle, angular distribution, nucleon interaction

ABSTRACT: The article deals with the extensive air shower observed in Tokyo by T. Matano et al. (Phys. Rev. Lett. v. 15, 623, 1965), whose characteristics were such that its estimated observation frequency, depending on the assumptions made, would be at best every ten years, whereas the experiment duration was only 3500 hours. The author shows that these experimental results become quite natural if one admits of the possibility that the nucleon goes over into a passive state after the interaction, a possibility discussed by him elsewhere (ZhETF v. 50, No. 5, 1966; preprint FIAN, No. 161, 1966). He calculates the angular distribution of the nucleons from this point of view, for a flux of particles traveling in the atmosphere at a given zenith angle, neglecting the fluctuations of the inelasticity coefficient for the interaction of the first-generation nucleons, and writes out equations for the depth

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ACC NR: AP6010433

variation of the flux of the first-generation baryons and the flux of the second-generation nucleons. It is shown from these calculations that the differential spectra of the nucleons have at  $86-87^\circ$  (the zenith angle of the extensive air shower observed in the Tokyo experiments) a sharp maximum in the same energy region as the shower ( $\sim 10^{15}$  ev). This yields a value of 0.25 for the number of events expected for the Tokyo experiments. Other features of these experiments are also briefly explained, and it is predicted that "horizontal" showers of this type will be observed and with the same probability. At smaller zenith angles the frequency of shower observations will increase. Orig. art. has: 2 figures and 5 formulas.

SUB CODE: 20 / SUBM DATE: 02Jan66/ ORIG REF: 004/ OTH REF: 002

Card 2/2

SMORODINA, T. A.

FD-799

USSR/Physics - Secondary emission

Card 1/1 Pub. 146-12/21

Author : Bronshteyn, I. M. and Smorodina, T. A.

Title : Secondary electron emission of thin layers of beryllium. I

Periodical : Zhur. eksp. i teor. fiz., 27, 215-223, Aug 1954

Abstract : The variation of the coefficient of secondary emission and the distribution of secondary electrons according to energies is studied during adsorption of atoms of Be and Ni. It is shown that during adsorption of pure Be the coefficient decreases monotonously, but in the case of not pure Be it first increases and then decreases down to the value for pure Be. Within the interval of 100 to 600 eV the depth of generation of secondary electrons depends linearly on the energy of the primary electrons. Indebted to R. Ye. Averbukh (deceased). Twelve references including 5 foreign.

Institution : Leningrad Pedagogical Institute

Submitted : June 26, 1953

USSR/Physics - Electron emission

FD-2423

Card 1/1 Pub. 146 - 13/19

Author : Bronshteyn, I. M.; Smorodina, T. A.

Title : Secondary electron emission of thin layers of beryllium. II

Periodical : Zhur. eksp. i teor. fiz., 29, October 1955, 495-499

Abstract : The authors investigate the variation in the coefficient of secondary electron emission, sigma, and the distribution of secondary electrons according to their energies in the case where thin layers of beryllium are deposited onto a silver underbase. They establish that during this imposition of thin beryllium layers (theta equal approximately to 1) onto nickel and silver the maxima of the curves of distribution of secondary electrons from the nickel and silver are displaced toward the side of less energies of the secondary electrons. Seven references: e.g. I. M. Bronshteyn and T. A. Smorodina, *ibid.*, 27, 215, 1954; I. M. Bronshteyn, *ZhTF*, 13, 176, 1943.

Institution : Leningrad State Pedagogic Institute

Submitted : June 14, 1954

Category : USSR/Photoeffect - Electron and Ion Emission

H-2

Abs Jour : Ref Zhur - Fizika, No 1, 1957, No 1652

Author : Bronshteyn, I.M., Smorodina, T.A.

Title : Secondary Electron Emission of Thin Layers of Silver

Orig Pub : Zh. eksperim. i teor. fiziki, 1955, 29, No 4, 500-506

Abstract : The role of the underlining in the determination of the depth of emergence of the secondary electrons was studied by coating the target with varying thicknesses of the tested substance. Silver layers from one to one hundred atomic layers thick were coated on nickel, on beryllium, and on a 26-atom layer of beryllium adsorbed on nickel. It was found that the beryllium lining hardly affects the true depth  $d_t$  of the emergence of secondary electron from silver or the dependence of  $d_t$  on the energy  $E_n$  of the primary electrons. The true and experimental values of the depth of emergence, obtained by adsorption of silver on nickel, as well as their dependences on  $E_n$ , differ strongly from each other. It is therefore necessary to employ a beryllium lining to determine  $d_t$ . The value of  $d_t$  determined in this investigation depends linearly on the energy of the primary electrons in the 100 -- 600 ev range. It was established that if a layer of electro-positive metal with a thickness on the order of one atom is adsorbed, the maximum of the energy-distribution curve of the secondary electrons shifts towards the lower energies (by 1.8 ev in the

Card : 1/2



Smorodina, T. A.

21  
Secondary electron emission of thin layers of beryllium.

III. I. M. Bronshtein and T. A. Smorodina. *Soviet Phys.*

*JETP* 2, 410-13(1956)(Engl. translation).—See *C.A.* 50,

2276b. B. M. R. 2

21

SMORODINA, T. A.

Secondary electron emission of thin layers of silver.  
I. M. Bronshtein and T. A. Smorodina. Soviet Phys.  
JETP 2, 414-19(1956)(Engl. translation). See C.A. 50,  
2276c. B. M. R.

BRONSHTEIN, I. M.  
NOT  
BRONSHTEIN, I. M.

"On the Problem of Determining the Effective Output Depth of Secondary Electrons," pp 65-67, 111, 7 ref

Abst: The article examines methods for determining the effective output depth of secondary electrons from substances which are of interest in clarifying the mechanism of secondary emission and also the kinetic movement of secondary, as well as (to a certain degree) primary, electrons in a substance. One method is the study of secondary emission and thin layers with increasing thicknesses. Data are presented which show that for an explanation of the change in emission properties of thin metallic layers for changes in their thickness, it is necessary to use a metallic base-layer.

SOURCE: Uchenyye Zapiski Leningr. Gos Pedagog. In-ta Min-va Prosveshcheniya RSFSR (Scientific Notes of the Leningrad State Pedagogical Institute of the Ministry of Education RSFSR), Volume 17 -- Physics - Mathematics Faculty, No 2, Leningrad, 1957

Sum 1844

KOMAROV, F. P.; GUGNINA, O. P.; RUZHNIKOVA, T. Ye.; SMORODINA, N. B.

Some problems in the bleaching of woodpulp. Trudy VNIIB no. 471  
76-85 '61. (MIRA 16:1)

(Woodpulp) (Bleaching)